Efficacy of ozonized olive oil in the management of oral lesions and conditions: A clinical trial

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Abstract

The oral cavity is an open ecosystem that shows a dynamic balance between the entrance of microorganisms (bacterial, viral or fungal), colonization modalities, nutritional balance, and host defenses against their removal. The oral lesions including aphthous ulcerations, herpes labialis, oral candidiasis, oral lichen planus, and angular cheilitis some of the common entities encountered in the clinical practice. A variety of treatment options is available in the literature for all of these lesions and conditions. Topical ozone therapy is a minimally invasive technique that can be used for these conditions without any side effects. **Aim and Objectives:** To evaluate the efficacy of ozonized olive oil in the treatment of oral lesions and conditions. **Materials and Methods:** A longitudinal study was carried out on 50 patients (aphthous ulcerations, herpes labialis, oral candidiasis, oral lichen planus, and angular cheilitis). The ozonized olive oil was applied twice daily until the lesion regresses for a maximum of 6 months. **Results:** All the lesions regress in patients with aphthous ulcerations, herpes labialis, oral candidiasis and angular cheilitis or showed improvement in the signs and symptoms in oral lichen planus patients. No toxicity or side effect was observed in any of the patients. **Conclusion:** Ozone therapy though requires a gaseous form to be more effective, but topical form can also bring out the positive results without any toxicity or side effect. Hence, it can be considered as a minimally invasive therapy for the oral infective and immunological conditions.

Keywords: Conditions, oral mucosal lesions, ozone therapy, topical O_3

Introduction

Ozone is present in the environment as a protective gaseous layer. It prevents living beings from the harmful effects of the high energy ultraviolet radiations. It was discovered in 1839 by Christian Friedrich Schonbein when he noticed the emergence of a pungent gas with an electric smell. The word ozone is derived from Greek word ozein that means odor.[1] Since then it has been the field of research and clinical application in medicine and dentistry. The first medical application of ozone was traced back to 1870 by Dr. C. Lender, who used it for purifying blood in test tubes.[2]

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Ozone is a triatomic gaseous molecule, consisting of three oxygen atoms, showed its efficacy in the management of various pathologies in the field of medicine and dentistry.[2] Ozone, which is used for medical purposes, is a gas mixture comprised of 95–99.95% oxygen and 0.05–5% pure ozone.[3] Due to proven therapeutic advantages of ozone, many fields in dentistry could benefit from ozone therapy. Review of literature revealed few studies indicating the use of medical grade ozone in the management of oral lesions and conditions.[4] Most of them used gaseous form which is produced by specially designed "Ozone Generator," is very expensive and need to be implicated immediately over the lesion.[4] For this, other method of ozone application is developed where it is used in solution form. More viscous solutions like olive oil is used for the better shelf life of the medication.[4]

Therefore, we conducted a study to evaluate the efficacy of ozonized olive oil in the treatment of oral lesions and conditions, and to evaluate the frequency and duration of the ozonized olive oil application required to manage the oral lesions and conditions.

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Materials and Methods

A longitudinal study was conducted on the patients attending the outpatient Department of Oral Medicine and Radiology, Swami Devi Dyal Hospital and Dental College, Panchkula. Ethical clearance was obtained from the college Ethical Committee. The patients with following oral lesions and conditions were included in the study and followed up for 1 year [Table 1].

The diagnosis of all these lesions was based on the clinical sign and symptoms and chairside diagnostic methods such as exfoliative cytology.

All the subjects with above-mentioned conditions were explained about the conditions and educated about the ozone therapy. All the volunteer subjects were included in the study.

Patients with conditions like pregnancy/lactating mother, history of systemic disease with surgical and nonsurgical therapy 6 months prior to the study, history of antibiotic, chemotherapeutic treatment, myocardial infarction, allergy to ozone, alcohol intoxication, hyperthyroidism, and severe anemia were excluded.

A total of 50 patients were included in the study and followed up for 6 months. Proper record of the clinical data (signs and symptoms, clinical photographs of the lesions, etc.) was maintained at every visit for each patient. Ozonized olive oil manufactured by Ozone Forum India, Bisleri, Mumbai, India, was used in the study and prescribed to the patient. The patient was explained about the procedure, and informed consent was taken. The subjects were clinically examined and subjected to inclusion and exclusion criteria. Topical application of ozonized olive oil was done for all the patients included in the study until the lesion cured. Sterile cotton plugs were used for topical application.

Topical application

Patients were asked to rinse the mouth with distilled water. The part of the oral mucosa with the lesion was isolated and ozonized olive oil was applied topically over the lesion with the help of the sterile cotton plug or gloved finger. The viscous oil was massaged over the area for 1 min [Figure 1]. The patient was advised not to have anything to eat or drink for ½ h. The application was done twice daily till the time lesion subsides, to a maximum of 6 months duration.

Follow-up

All the patients were recalled weekly after the regression of lesion for a maximum of 6 months. At every recall visit, patient's signs and symptoms such as burning sensation were evaluated and noted in the records. The size of the lesion was recorded at every visit and compared.

Results

All the patients with oral candidiasis, angular cheilitis, aphthous ulcers, and herpes labialis showed 100% cure with variable duration of treatment interval 2.1, 2.3, 1.5, and 2.2 days respectively [Table 2 and Figures 2-4].

All the five patients of oral lichen planus showed improvement in the signs and symptoms with dramatic reduction in their burning sensation to no burning sensation in 4.6 days (mean) [Table 2].

Table 1: Oral lesions and conditions included in the study

Lesion	Number of patients (*n*)
Oral candidiasis	20
Angular cheilitis	10
Recurrent aphthous stomatitis	10
Oral lichen planus	5
Herpes labialis	5

Table 2: Results of ozone therapy

Lesion	Number of patients (*n*)	Cured (yes/no)	Duration (days)	
			Mean	SD
Oral candidiasis	20	Yes	2.1	0.64
Angular cheilitis	10	Yes	2.3	0.48
Recurrent aphthous stomatitis	10	Yes	1.5	0.53
Oral lichen planus	5	Yes	4.6	0.55
Herpes labialis	5	Yes	2.2	0.45

SD: Standard deviation

Figure 1: Topical application of ozonized oil

Figure 2: Preoperative picture of a case of pseudo membranous candidiasis

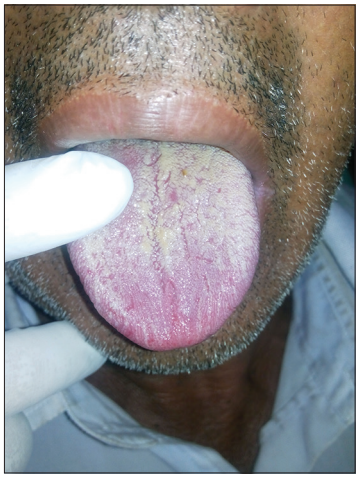

Figure 3: Postoperative picture of a case of pseudo membranous candidiasis

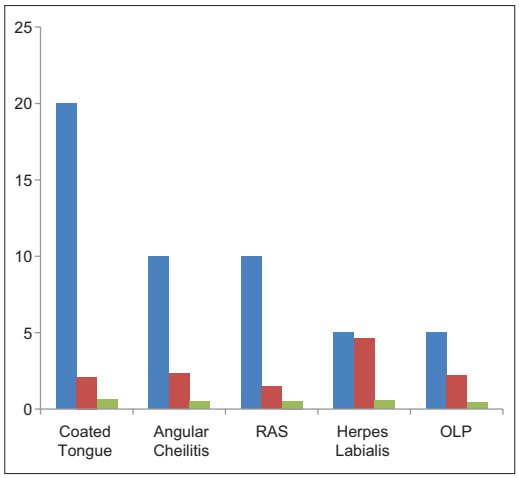

Figure 4: Graphical presentation of the treatment outcomes. Blue: Number of patients, red: Time in days, green: Standard deviation

Discussion

Ozone is a triatomic molecule, consisting of three oxygen atoms. Its molecular weight is 47, 98 g/mol and thermodynamically highly unstable compound that dependent on system conditions like temperature and pressure, decompose to pure oxygen with a short half life.[3] Ozone is 1.6 fold denser and 10 fold more soluble in water (49.0 mL in 100 mL water at 0°C) than oxygen. Although ozone is not a radical molecule, it is the third most potent oxidant (E_5 12.076 V) after fluorine and persulfate. Ozone is an unstable gas that cannot be stored and should be used at once because it has a half-life of 40 min at 20°C.[3] Ozone is naturally produced by the photodissociation of molecular oxygen into activated oxygen atoms, which then react with further oxygen molecules. This transient radical anion rapidly becomes protonated, generating hydrogen trioxide, which, in turn, decomposes to an, even more, powerful oxidant, the hydroxyl radical. It is the fundamental form of oxygen that occurs naturally as a result of ultraviolet energy or lightning, causing a temporary recombination of oxygen atoms into groups of three.

Synthetic ozone can be produced by 3 different systems:[5,6]

- Ultraviolet system produces in low concentrations of ozone used in esthetics, saunas, air purification
- Cold plasma system used in air and water purification
- Corona discharge system produces a high concentration of ozone.

Presently, there are nine methods of ozone therapy in medical practice namely direct intra-arterial and intravenous application, rectal insufflations, intramuscular injections, major and minor autohemotherapy, ozonated water, intra-articular injection, ozone bagging, ozonated oil, and inhalation of ozone.[6] Topical preparations have no adverse effects, so ozonated olive oil was used in the present study.

In the clinical setting, an oxygen/ozone generator simulates lightning via an electrical discharge field. Ozone gas has a high oxidation potential and is 1.5 times greater than chloride when used as an antimicrobial agent against bacteria, viruses, fungi, and protozoa. It also has the capacity to stimulate blood circulation and the immune response. Such features justify the current interest in its application in medicine and dentistry and have been indicated for the treatment of 260 different pathologies.[7]

Mechanism of action

Ozone is an inactivated, trivalent (O_3) form of oxygen (O^2). Ozone breaks down into two atoms of regular oxygen by giving up an atom of singlet oxygen over a period of 20–30 min.[8,9] Ozone is considered one of the most potent oxidants in nature, but the mechanism of its therapeutic action is unclear. Some of the possible explanations for this include the generation of peroxides by ozonolysis with unsaturated fatty acids in cell

membranes, activation or generation of reactive oxygen species which function as physiological enhancers of various biological processes (including increased production of adenosine triphosphate), and increased expression of intracellular enzymes with antioxidant activity. It has been reported that exposure to ozone results in a change in the level of a variety of biological factors, e.g., cytokines (interferon c, tumor necrosis factors a, transforming growth factor b and interleukin-8), acute phase reactants and adhesion molecules from the integrin family such as CD11b. Other reports suggest increased motility and adhesion of peripheral blood polymorphonuclear cells to epithelial cell lines after exposure to ozone. Similarly, major autohemotherapy-induced leukocytosis and enhanced phagocytic activity of polymorphonuclear cells have been reported.

The present study showed 100% cure rates in coated tongue, recurrent aphthous stomatitis, angular cheilitis, herpes patients, and improvements in the oral lichen planus patients can be due to above said mechanism. No patient included in the study showed adverse effects or toxicity, showing the safety margins of the topical agent. Within the limitation of the study of a small number of cases, the healing of the lesions showed faster rates compared to the other conventional treatments, depicting the higher efficacy of the topical ozone therapy.

Limitations of the study

The main limitation of the study was small sample size because it was a clinical trial, so a multicentered study with larger sample size is invited.

Conclusion

Modern dentistry is all about non/minimal invasive dentistry. Ozone therapy in the present stage is reducing caries activity, improving periodontal health, and also improving the healing time of oral lesions and wounds. Ozone therapy is bound to revolutionize the way dentistry is going to be practiced in the future.

Current data on the usage of ozone therapy as therapeutic options for various oral lesions and conditions lacks sufficient data and therapeutic advantage over available conventional therapeutic modalities.

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Conflicts of interest

There are no conflicts of interest.

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